Geophysical Research Abstracts,
Vol. 11, EGU2009-6490, 2009
EGU General Assembly 2009

The White Sea dynamics features derived by observations and modelling.

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The results of the many years of observational and modelling activity for White Sea investigation are presented. White Sea is a relatively shallow inlet of Barents Sea with the mean depth about 67m. There is a shallow (20-40m) and narrow (30-40km) passage (so called the Gorlo – "The Neck") between White and Barents Seas. Nevertheless White Sea is characterized as the area with high density of kinetic and available potential energies, which often several times exceed analogues estimates for other seas and for typical ocean conditions. It is due to strong tides, with tide heights up to 6-8m in the Gorlo and the Mezen Bay. There is also a large river run-off, with the annual discharge up to 4% of the total sea volume, and the transport of relatively salt and cold (in summer) Barents Sea waters. The combination of these factors makes the White Sea the unique object, a place where a wide range of phenomena takes place in a rather limited area.

The Gorlo plays the principal role in the White Sea dynamics, acting as a kind of a hydro-dynamical filter for the incident Kelvin tidal wave. So, tide spreads as pure gravitational waves, thus the water exchange of the Central part of the sea (the Basin) with the Barents Sea improves significantly. The group velocity of the tidal wave, traveling from the Gorlo towards the Basin, drops as the horizontal scale changes and the Coriolis force becomes more important. This effect leads to the formation of the hydrological front. The tidal wave, entering the Basin, radiates inertial-gravity waves and Kelvin wave, which appeared to be the main modes of the velocity variability. It was shown, that these modes might be purely gravitational (in the area of the Solovetskiye Islands) or almost inertial (in some areas of the Basin), depending on the characteristic horizontal scales of the location.

A set of numerical experiments with the original model by E. Semenov and M. Luneva were carried out to estimate the role of various physical mechanisms in the White Sea mean state and variability formation: tides, vertical mixing, wind, river run-off and thermohaline circulation.

The calculated residual tidal circulation is the regular cyclonic gyre in the Basin. This circulation is consistent with the dynamics of the slow quasigeostrophic topographic mode, drove by potential vorticity conservation low.

It was shown, that the thermohaline structure is formed primarily by the residual tidal circulation, and acts as the "dynamical memory" of the latter. Numerical experiments show that the tidal circulation may rapidly, during several days, restore the disturbed – say, by storm – large-scale hydrological structure of the White Sea waters. This fact gives the scientific basis for the simplified formulation of the method of the hydrophysical characteristics monitoring, and to consider the problem as a purely boundary value one.

This assumption was confirmed by the comparison of observations with data of model simulations, carried out in the real time operation mode, with the actual synoptic atmospheric forcing.

The problems of the model development are presented – especially the problem of taking into account the drifting sea ice in the presence of high tides.

Some aspects of the developing the real time monitoring system of the White Sea are also discussed.